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LXXXIX. Fig. 36.
$AOC=APE$. $MNB=HFB$.
$MNOL=HKPB$.
$\therefore ABML \asymp ACDE+DFHK$. Q. E. D.

XC. Fig. 37.
$PBR=SBK$. $RPLO=ETAD$.
$LNO=ATF$. $NMAC=SBAH$.
$\therefore ABLM \asymp ADEF+AHKC$. Q. E. D.

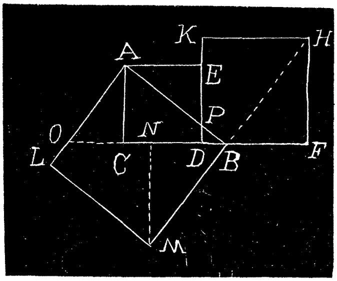

Fig. 36.

It will be observed that the above proofs differ chiefly in the relative position of the triangle and the squares. In order to give an idea of still other possible varieties, it may be noted for example, that instead of the arrangement as we have it it Fig. 35, the given triangle may have seven other positions within the square *ACKH*, right angles coinciding. Furthermore, in each case, the square on the hypotenuse may be constructed outwardly from the triangle, or overlapping it. One of these cases, it will be remembered, was considered in November number, 1897.

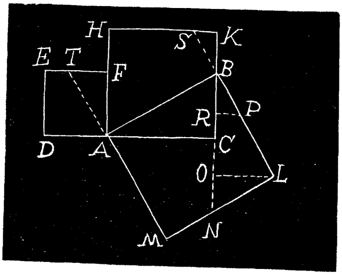

Fig. 37.

[To be continued.]

DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

104. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute,Decorah, Iowa.

If I should buy goods at a price 20% higher than I did buy them, and sell the goods for the same amount that I did sell them, I would gain 25% less than I did gain. What per cent. did I gain? (Solve by Arithmetic).

I. Solution by W. F. DRADBURY, Head Master, Cambridge Latin School, Cambridge, Mass.

If I gain 25% less, I get $\frac{6}{5}\times\frac{25}{100}$, or $\frac{150}{500}$ of \$1 less than if I sold at the same per cent. advance. If I sell at same per cent. advance, I should receive $\frac{6}{5}(1+\frac{r}{100})=\frac{6}{5}+\frac{6r}{500}$. What I did receive was $1+\frac{r}{100}$. Subtract, and we have

$\frac{1}{5}+\frac{r}{500}$ loss, or $\frac{1}{5}+\frac{r}{500}=\frac{150}{500}$, $\frac{r}{500}=\frac{50}{500}$, or $r=50$.

Do you call this an Arithmetical solution? Instead of r, suppose you write "*same*"? Pure Algebra: $1+\frac{r}{100}=\frac{6}{5}\left(1+\frac{r}{100}-\frac{25}{100}\right)$. Then $r=50$.

[NOTE.—According to our definition of an algebraical solution, No. 5, Vol. V., page 139, of the MONTHLY, Professor Bradbury's solution is algebraic. It is immaterial as to what sort of a character is used to represent the quantity sought. It may be a letter, a character of any kind, a word, or several words.

The definition referred to, viz.: Any solution in which the result sought is represented by some character, which character is operated upon until the condition or conditions of the problem are fulfilled which condition or conditions are stated in the form of an equation from which the numerical value of the character is determined, is an algebraic solution,—has received the sanction of some of the best mathematicians in this country. EDITOR F.]

II. Solution by J. OWEN MAHONEY, B. E., Mc., Professor of Mathematics and Science, Carthage Graded and High School, Carthage, Tex.; J. W. YOUNG, Columbus, O.; ELMER SCHUYLER, High Bridge, N. J.; WALTER H. DRANE, Graduate Student, Harvard University, 65 Hammond Street, Cambridge, Mass.; and the PROPOSER.

Since 100% of the purchasing price is paid for the goods in the first instance, it is easily seen that

the % gain$-$20% : 120 :: the % gain$-$25% : 100,
or the % gain$-$20% : 5% :: 120 : 20
or the % gain$-$20% : 5% :: 6 : 1.
$\therefore$ The % gain$=$50.

III. Solution by B. F. FINKEL, A.M., M.Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

1. Let 100%$=$actual cost, then
2. 120%$=$supposed cost.
3. Let *100%*$=$selling price. [The italics are used for distinction].
4. $\mathit{100}\%-100\%=$actual gain, and
5. $\mathit{100}\%-120\%=$supposed gain.
6. $\frac{\mathit{100}\%-100\%}{100\%}-\frac{\mathit{100}\%-120\%}{120\%}=\frac{1}{4}$, or $\frac{\mathit{100}\%-100\%}{100\%}-\frac{\mathit{83\frac{1}{3}}\%-100\%}{100\%}=\frac{1}{4}$,

or $\frac{\mathit{16\frac{2}{3}}\%}{100\%}=\frac{1}{4}$, whence

7. $\mathit{16\frac{2}{3}}\%=25\%$; $\mathit{1}\%=1.5\%$; $\mathit{100}\%=150\%$, selling price in terms of cost price.
8. $\therefore$ $150\%-100\%=50\%$, the gain %.

Also solved by *G. B. M. ZERR* and *B. F. YANNEY*.

105. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute, Decorah, Iowa.

A teacher looks at his watch when leaving school at noon. When he comes back he finds that the hour hand and the minute hand have just changed places (that they had when he left the school). What time was it when he left, and what time when he came back to school? (Solve by Arithmetic.)

I. Solution by JOHN M. ARNOLD, Crompton, R. I.

During the time that the teacher was away from the school, the distance traveled by the minute hand added to the distance traveled by the hour hand,